Training Material Contents

Workshop and program outline

Workshop 1 (*Thurs 22nd October*)

1. Climate change and buildings – why respond?
2. Introducing a method to assess a building's vulnerability to climate change
3. Guided case-studies on applying the vulnerability assessment
4. How to undertake council-specific assessments (take-home exercise)

Workshop 2 (*Thurs 19th November*)

1. Sharing of assessment learnings
2. Case-study presentations across councils, with specific experiences from City of Whitehorse
3. *Essential Services Commission* presentation on Local Government Rates Capping & Variation Framework, with Q&A
4. Discussion forum on vulnerability assets and current asset management practices

Optional pre-reading

David Logan, *Manager Capital Works, City of Whitehorse*, wrote a short paper on the vulnerability assessment approach developed by Arup and the council. He describes the methodology from an asset manager's perspective, and discusses key findings for the council.

The paper can be accessed freely at the following link.
www.ipwea.org/RoadsTransportDirectorate/ViewDocument/?DocumentKey=909371f7-9ffa-4123-882c-c9bceb52d239

Part 2:
Foundation concepts

Summary of projected climate change for the NAGA region

Change in climatic exposures and trend	Metric	2030	2070
Warmer and/or fewer cold days and nights over most land areas	Fewer frosts (days where the minimum temperature falls to 2°C or less) 3 in 2007	2 in 2030	0 in 2070
Warmer and/or more frequent hot days and nights over most land areas	An increase in average annual temperature	0.8°C by 2030	2.6°C by 2070
Warm spells/heat waves. Frequency and/or duration increases over most land areas	An increase in the average number of days >30°C, from 30 in 2007	34 in 2030,	49 in 2070
	An increase in the average number of days >35°C, from 9 in 2007	11 in 2030	20 in 2070
	An increase in the average number of days >40°C, from 1 in 2007,	2 in 2030	5 in 2070
	An 'urban heat island' (UHI) effect will lead to additional increases in temperature in built-up areas due to increasing numbers of buildings and hard surfaces.		
Heavy precipitation events, increase in the frequency, intensity and/or amount of heavy precipitation	An increase in rainfall intensity during winter months. Alongside more frequent and severe storm events	2.6 per cent increase by 2030	17 per cent increase by 2070
Increases in intensity and/or duration of drought	A reduction in average rainfall. Greatest reduction to occur during spring	4 per cent by 2030	11 per cent by 2070
	A reduction in rainy days during summer. Increased occurrence of drought	6 per cent by 2030	20 per cent by 2070
Increase incidence and/or magnitude of extreme high sea level	An increase of 0.20m by 2040, 0.47m by 2070 and 0.82m by 2100		
Changes in wind velocity	Inconclusive		
Increased bushfire frequency and intensity	In Melbourne, the number of 'extreme' fire danger days is expected to increase by between 12 per cent and 38 per cent by 2020, and by between 20 per cent and 135 per cent by 2050		

Summary of projected climate change for the EAGA region

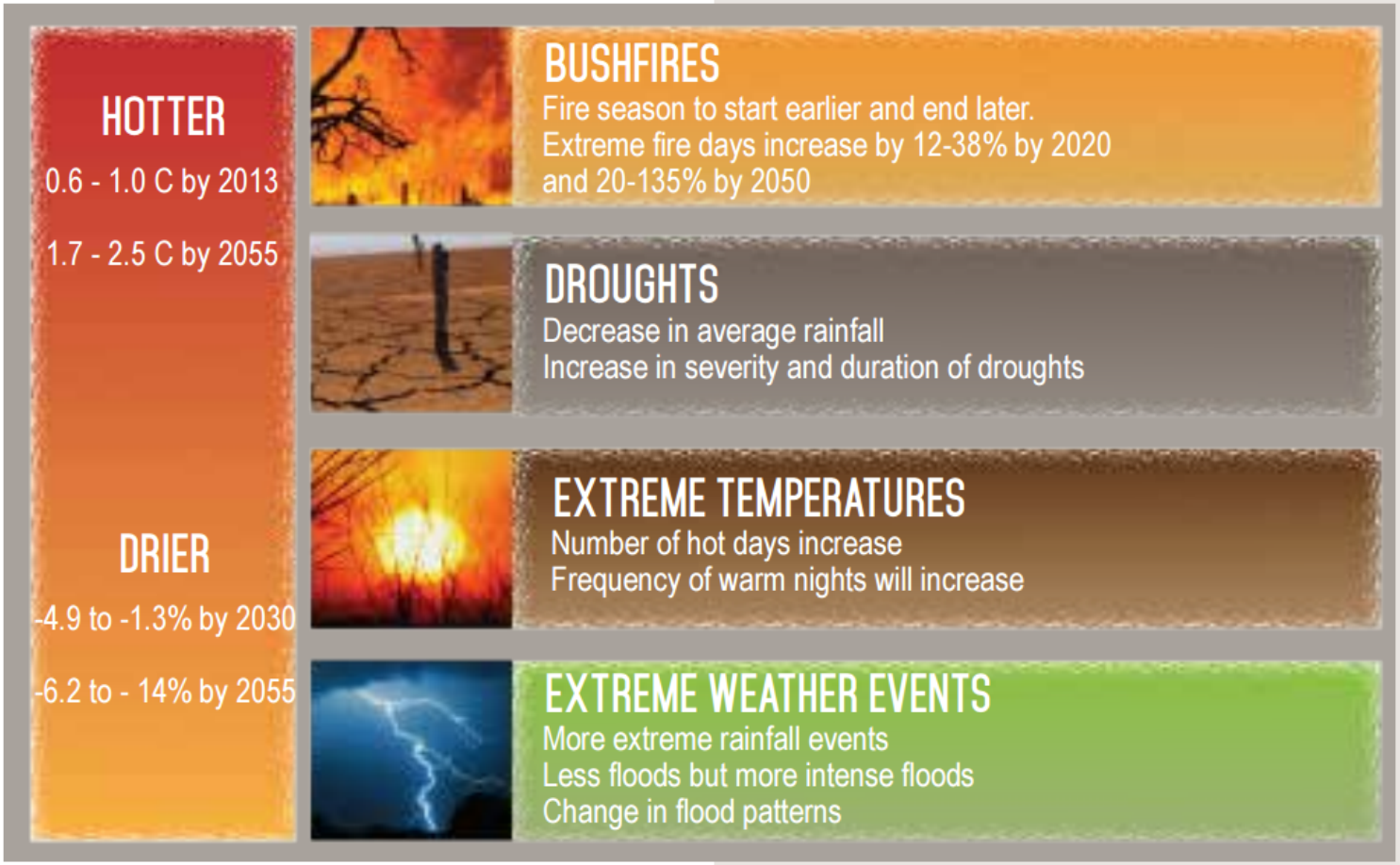

Figure 1: Climate change projections for Melbourne's EAGA region (CSIRO 2013)

Activity 1 – Importance of functional requirements to building use

In groups, discuss / debate the following:

- Is thermal comfort more, less or equally important at an office compared to a childcare centre? Why?
- Is power supply more, less or equally important at a community hall compared to a leisure centre? Why?
- Is power supply more, less or equally important at a community hall (that is also designated as a relief / recovery centre) compared to a leisure centre? Why?

Share your answers with the group

Activity 2 – Relationship between functional requirements and building components

Connect the functional requirements to the components that provide them

Functional requirements	Building components
Structural performance	Walls
Thermal comfort	Roof
Air quality	Windows
Sanitation	Floors
Power	Foundations
Communications	Doors
Weather resistance	Air-conditioning
Fire resistance	Electrical Switchboard
	Sewer
	Water supply
	Phone line

Notes

Notes

Part 3:
Guided Assessment

An example building

Inner city childcare centre

1970s brick building built on clay ground, with shallow footings and a concrete slab above.

The walls have no movement joints.

Metal finish corrugated roof.

The building is naturally ventilated using the windows.

It uses a Mitsubitshi ceiling cassette air conditioning units (model SLZ-KA50VA) – the outdoor (heat rejection) unit is located on the roof.

SLZ-KA Series
Compact ceiling cassette

INDOOR UNIT

OUTDOOR UNIT

MXZ-6C120VA

SUZ-KA50VA2

SUZ-KA25/35/VA2

OPTIONAL CONTROLLERS

WIRED OR WIRELESS

R410A

HEAT PUMP

DC Inverter

DC Inverter | PAM Control | Long Life (2,500 hours Filter) | Fresh Air Intake | AUTO VANE | 2x2 Size | 12-hour Timer (SLZ-KA VAL) | ACO | Auto Restart | Cooling at 46°C/-10°C (KA25/35) | Cooling at -10°C | Heating at -15°C | (SLZ-KA VA) | Weekly Timer (SLZ-KA VA) | Centralized On/Off (Optional)

M-NET connection (Optional) | Self Diagnosis (with wired R/C check code) | 12m 20m (KA25/35) | 30m 30m (KA50) | MXZ connection | Flare connection | Pure White

4way Cassette Type Specifications

Type				Inverter Heat Pump (R410A)		
Model Name				**SLZ-KA25VA**	**SLZ-KA35VA**	**SLZ-KA50VA**
Indoor Unit				SLZ-KA25VA(L)*	SLZ-KA35VA(L)*	SLZ-KA50VA(L)*
Outdoor Unit				SUZ-KA25VA2	SUZ-KA35VA2	SUZ-KA50VA2
Power Supply [V, Phase, Hz]				230V, Single, 50Hz, Outdoor unit power supply		
Cooling	**Capacity [Min. - Rated - Max.]**		kW	0.9 - 2.5 - 3.2	1.0 - 3.5 - 3.9	1.1 - 4.6 - 5.2
	Total Input [Min. - Rated - Max.]		kW	0.25 - 0.68 - 1.00	0.27 - 1.04 - 1.33	0.49 - 1.53 - 2.13
	Rated EER			3.68	3.37	3.01
		Star Rating		2.0	1.5	1.0
	Running Current [Rated]		A	3.70	5.00	6.90
	Sound Pressure	IN [Lo - Med - Hi]	dB(A)	28 - 31 -37	29 - 33 - 38	30 - 34 - 39
	Level	OUT at 1m (PWL)	dB(A)	46 (59)	47 (60)	53 (68)
	Air Volume (IN) [Lo - Mid.- Hi]		ℓ/S	133 - 150 - 167	133 - 150 - 183	133 - 150 - 183
Heating	**Capacity [Min. - Rated - Max.]**		kW	0.9 - 3.0 - 4.5	0.9 - 4.0 - 5.0	0.9 - 5.0 - 6.5
	Total Input [Min. - Rated - Max.]		kW	0.17 - 0.85 - 1.36	0.25 - 1.09 - 1.46	0.39 - 1.55 - 3.36
	Rated COP			3.76	3.67	3.22
		Star Rating		2.0	2.0	1.5
	Running Current [Rated]		A	4.30	5.1	7.10
	Sound Pressure	IN [Lo - Med - Hi]	dB(A)	28 - 31 -37	29 - 33 - 38	30 - 34 - 39
	Level	OUT at 1m (PWL)	dB(A)	46 (59)	48 (61)	55 (68)
	Air Volume (IN) [Lo - Mid.- Hi]		ℓ/S	133 - 150 - 167	133 - 150 - 183	133 - 150 - 183
Starting Current			A	3.65	4.75	6.75
Max. Running Current			A	8.16	9.18	16
Indoor	**Input [Rated]**		W	75	85	85
	Dimensions [H x W x D]		mm	208 x 570 x 570	208 x 570 x 570	208 x 570 x 570
		Panel	mm	20 x 650 x 650	20 x 650 x 650	20 x 650 x 650
	Weight (Panel)		kg	16.5 (3)	16.5 (3)	16.5 (3)
Outdoor	**Dimensions [H x W x D]**		mm	550 x 800 x 285	550 x 800 x 285	850 x 840 x 330
	Weight		kg	33	37	53
	Breaker Size		A	10	10	20
Ext. Piping	**Diameter (Gas / Liquid)**		mm	9.52 / 6.35	9.52 / 6.35	12.7 / 6.35
	Max. Length / Height		m	20 / 12	20 / 12	30 / 30
Guaranteed Operating Range		Cooling	℃	-10 ~ 46	-10 ~ 46	-10 ~ 43
[Outdoor]		Heating	℃	-15 ~ 24	-15 ~ 24	-15 ~ 24

Importance of Functional Requirement to Building Use

Note *– these are indicative only – they should be adjusted as appropriate in the context of the specific building and service delivery being assessed*

Building use	Importance of function to building use						
	Thermal comfort	Air quality	Power	Access (lifts)	Structural performance	Weather resistance	Fire resistance
Town Hall	Medium	Medium	Medium	Medium	Importance for all buildings is based on potential impact: Damage (e.g. cracking, sagging, doors / windows jamming) – Medium Damage and significant secondary impacts (e.g. cracking in basements, damage to retaining walls) – High Failure (e.g. roof sheeting tearing off) – High	Medium	The importance of fire resistance for a particular building is related to whether the building is likely to be occupied during periods of fire risk, the impact of the asset being unavailable after a fire, and the cost to repair / rebuild the asset if damaged by fire. These need to be considered carefully for the specific building being assessed.
Administrative offices	Medium	Medium	High	Medium		Medium	
Library	Medium	Medium	Medium	Medium		High	
Gallery	Medium	Medium	Medium	Medium		High	
Theatre / performing arts centre	Medium	Medium	Medium	NA		Medium	
Age care facility	High	High	High	High		Medium	
Council Depot	Medium (office) Low (workshops)	Medium	High	NA		Medium	
Leisure Centre	Low	Medium	Medium	Medium		Medium	
Sport oval and pavilions	Medium	Medium	Medium	Low		Medium	
Childcare centre	High	High	Medium	Low		Medium	
Emergency relief / recovery centre	Medium	Medium	High	Medium		High	

Formulating actions worksheet

Vulnerability	Option		Pros	Cons	Estimated cost
	Options to reduce exposure				
	Options to reduce sensitivity				
	Options to reduce importance of functional requirement to use				

Formulating actions worksheet

Vulnerability	Option		Pros	Cons	Estimated cost
	Options to reduce exposure				
	Options to reduce sensitivity				
	Options to reduce importance of functional requirement to use				

Part 4:
Self-assessment

Steps for undertaking an assessment

The building component assessment sheets facilitate an assessment using a step-by-step approach. For further details on the steps, please see the following instructions:

1. Fill out the relevant individual Building Component Assessment Sheets.
    a. On each sheet, answer the prompting questions related to *Exposure* and *Sensitivity* as best matches the building.
    b. Use the highest exposure and sensitivity to determine the *Potential Impact Rating*.
        i. If **all** aspects of exposure or sensitivity are not applicable, then select *Not Applicable* at the bottom of the page.
        ii. If aspects of exposure or sensitivity are unknown, then select *Unknown* at the bottom of the page. The only exception is when one aspect is "unknown", but another has a "high" exposure or sensitivity. In this case, use the "high" to determine the impact rating, because it suggests that the component is already particularly exposed or sensitive to the climatic variable in question.
2. Combine the *Potential Impact Rating* and the importance of *Building Functional Requirement* to Building Use to estimate the vulnerability rating.
3. Transfer the vulnerability ratings to the Prioritised Vulnerabilities Action Sheet. Arup recommends the following responses to the vulnerability scores:
    a. "Very high" vulnerabilities should be considered further for priority capital works spending.
    b. "High" and "medium" vulnerabilities be considered at times of refurbishment and replacement.
    c. "Unknowns" should be investigated where practical. Alternatively, a conservative approach could be taken and assume the worst case for the unknown aspect.

Prioritising assessments (a streamlined processed)

Undertaking comprehensive climate change vulnerability assessments for every building within a Council's portfolio is likely to be beyond the resources of most Councils.

Whilst an assessment across the Council's portfolio will be comprehensive, there is a strategic and streamlined approach to building assessments. Councils can prioritise the buildings that they wish to assess in different ways:

- by building use
- by climate event

Part 5:
Take home activity